Gastrointestinal Bleeding: Who Needs Urgent Endoscopic Intervention?

Denis M. McCarthy

Published online: 4 July 2013

© Springer Science+Business Media New York (Outside the USA) 2013

Upper gastrointestinal bleeding (UGIB), a common occurrence, has received a great deal of attention in the clinical literature. UGIB is highly variable in severity and outcome, ranging from clinically insignificant to exsanguinating fatal hemorrhage. Diagnosis of UGIB is generally straightforward with good consensus that resuscitation, circulatory volume replacement and hemodynamic stabilization are the first priorities in management, which may also include intubation, blood transfusion and replacement of clotting factors as needed. Defining the need for and timing of endoscopy has received much less scrutiny. While the ideal might be to provide endoscopy after stabilization, such a practice applied 24 h/day, 7 days/week, would place major burdens on specialist physicians and resource utilization while greatly increasing facility costs. To address these issues, endoscopy within 6, 12, and 24 h of presentation has been advocated, albeit with some defined exceptions.

Numerous scoring systems have been proposed to predict prognosis, mortality and the likely need for hospitalization, transfusion, intensive care or surgical intervention [1], but none have been widely adopted. The Glasgow–Blatchford scale [2] is among the most useful, being based on simple clinical findings in the patient prior to endoscopy. Most would agree that a systolic blood pressure (SBP) <100 mmHg, a heart rate (HR) >100/min, or the

presence of orthostatic changes, often in the setting of increased bowel sounds, are indicators of a hemorrhage that is severe and ongoing. These signs may however not be present until approximately 30 % of the blood volume has been lost and the patient is about to enter stage III shock, as classified by the American College of Surgeons [3]. Needed are simple methods of quickly identifying the patient who is actively bleeding and in whom endoscopic intervention and therapy would likely arrest hemorrhage and prevent the deterioration that leads to complications such as renal failure, myocardial ischemia or stroke. Development of this kind of score has been attempted with some success, although limited by exclusion of some patient categories, by inclusion of patients up to 12/13 h after presentation, by being positive only when hemorrhage was often advanced, and by ambiguous patient categorization [4, 5].

In this issue of the journal, Iwasaki et al. [6], in a retrospective study of 366 patients with GIB, describe two predictors of active bleeding, identified in the 166 cases that underwent both nasogastric tube aspiration (NGT) and subsequent endoscopy. While the study has a number of shortcomings, nevertheless, in univariate and multivariate analyses, they found two observations, each strongly predictive of endoscopic documentation of active bleeding, namely, a bloody nasogastric aspirate and a HR/SBP ratio ≥ 1.4 , with the predictive value enhanced when both observations were positive. That the presence of blood in the nasogastric aspirate is highly significant in predicting active or recurrent bleeding is well recognized [4, 5, 7], but despite a wealth of physiologic research on responses to hemorrhage in man and animals, these cardiovascular responses have been understood only superficially by gastroenterologists. In this study a threshold value of HR/SBP was objectively derived from a receiver operating

D. M. McCarthy (✉)

Raymond G Murphy VA Medical Center, New Mexico Regional VAMC, 1501 San Pedro Blvd. SE, Albuquerque, NM 87108, USA

e-mail: denis.mccarthy2@va.gov

D. M. McCarthy

Division of Gastroenterology and Hepatology, University of New Mexico School of Medicine, Albuquerque, NM, USA

characteristic (ROC) curve (Fig. 2 in Ref. 6), to minimize bias in the determination of the threshold value. The sensitivity (using both parameters) was not high (64.9 %), with a specificity of 76.7 %. The resultant positive predictive value (PPV) of 44.4 % is not impressive, but probably more important, in what is essentially a screening process, was an impressive negative predictive value (NPV) of 88.4 %. Using these predictors <12 % of active bleeders would have had their endoscopic intervention unnecessarily delayed.

This editorial recognizes several shortcomings of the present study: the authors acknowledge the clear need to confirm their findings prospectively, in large numbers of cases and in many centers in different countries. Here we wish to draw attention to the simple metric of HR/SBP, as being potentially very useful when a quick decision is needed. To my knowledge, calculation of this value is not routinely employed clinically in Europe or the United States. Like other tests, it will likely exceed the threshold value only in cases of relatively severe hemorrhage, but unlike many other scoring systems that include multiple parameters in their calculations, this predictor can be calculated easily by simple mental arithmetic. If its usefulness can be confirmed in other studies, necessary endoscopy will be delayed in very few cases. Future clinical studies of GIB should routinely calculate, examine and record this simple predictive score.

The rising ratio of HR to SBP during hemorrhage requires an understanding of how these parameters are interrelated. Although a detailed review is beyond the scope of this review, interested readers are referred to standard textbooks of physiology [8, 9] from which the following summary of related topics is derived. The body is essentially programmed to use a variety of compensatory methods to sustain blood pressure as a high priority as intravascular blood volume falls, in order to maintain perfusion of vital organs. With progression from initially mild to moderate bleeding (ACS classes I and II), involving <30 % depletion of blood volume, a critical role is played initially by immediate responses to signals originating from baroreceptors in several sites, but, as bleeding continues and blood volume falls further, there is increasing participation by additional signals originating from chemoreceptors in the carotid sinus, and from ischemia receptors within the medulla oblongata. It is at early stages of hypovolemia, when bleeding is active but serious shock has not yet developed, that decisions as to endoscopic intervention are likely to have their greatest impact on morbidity and mortality. Overt evidence of active bleeding (e.g. frank hematemesis, or passage of bright red blood or copious melena/rectum) is not always present at this point, and changes in hematocrit and blood urea nitrogen are delayed. A simple indicator (HR/SBP >1.4) may prove of considerable value, but how does the ratio rise?

Blood loss reduces blood volume, which reduces venous return and consequently cardiac output, especially stroke volume. These changes transiently affect SBP, immediately reducing baroreceptor signaling to central receptors. This alters central parasympathetic tone, and in turn reflexly reduces vagal efferent activity and increases sympathetic responses, all occurring within 30 s. Diminished vagal tone allows some acceleration in HR. Increased sympathetic drive improves cardiac contractility, and also stimulates arterial and venous vasoconstriction, thus improving venous return. These responses almost immediately restore SBP to normal, or initially to even slightly hypertensive levels. There are immediate increases in the output of epinephrine and norepinephrine accompanied by rapid release of renal angiotensin and an increase in plasma renin. Other aldosterone-dependent and pituitary responses occur over several hours. Together all of these mechanisms contribute to the strong support of SBP, but this is achieved at the cost of rapid and progressive increases in HR.

Thus the altered ratio of HR/SBP described in the present study is quite compatible with changes predictable from physiologic experiments. What remains to be explored is the clinical usefulness and limitations of the HR/SBP ratio, in serving as an indicator of both continuing hemorrhage and of the need for urgent endoscopy and therapy. In this study, the method of determining the threshold seems mathematically sound. Of additional interest would be to use the prospectively determined threshold value of the ratio, or perhaps changes in the ratio over time, in large outcome studies, to determine the benefits of early endoscopic intervention. The major outcome might well be the addition to our diagnostic armamentarium of a simple, new physical sign.

References

1. Chen I-C, Hung M-S, Chiu T-F, Chen J-C, et al. Risk scoring systems to predict need for clinical intervention for patients with non-variceal upper gastrointestinal tract bleeding. *Am J Emerg Med.* 2007;25:774–779.
2. Blatchford O, Murray WR, Blatchford M. A risk score to predict need for treatment of upper gastrointestinal hemorrhage. *Lancet.* 2000;356:1318–1321.
3. Copstead LE, Banasik J. *Pathophysiology*, 5th ed., chap. 20. St. Louis, MO, USA: Saunders; 2013:439–440.
4. Adamopoulos AB, Baibas NM, Efstathiou SP, Tsioulos DI, et al. Differentiation between patients with acute upper gastrointestinal bleeding who need acute upper gastrointestinal endoscopy and those who do not: a prospective study. *Eur J Gastroenterol Hepatol.* 2003;15:381–387.
5. Lim LG, Ho KY, Chan YH, Khor CJ, et al. Urgent endoscopy is associated with lower mortality in high-risk but not low-risk nonvariceal upper gastrointestinal bleeding. *Endoscopy.* 2011;43:300–306.

6. Iwasaki H, Shimura T, Yamada T, Aoki M, et al. Novel nasogastric tube-related criteria for urgent endoscopy in nonvariceal upper gastrointestinal bleeding. *Dig Dis Sci*. (Epub ahead of print). doi:[10.1007/s10620-013-2706-x](https://doi.org/10.1007/s10620-013-2706-x).
7. Corley DA, Stefan AM, Wolf M, Cook EP, et al. Early indicators of prognosis in upper gastrointestinal hemorrhage. *Am J Gastroenterol*. 1998;93:336–340.
8. West JB. *Best and Taylor's Physiologic Basis of Medical Practice*, 12th ed., chap. 16. Baltimore, MD, USA: Williams and Wilkins; 1991:281–288.
9. Guyton AC, Hall JE. *Textbook of Medical Physiology*, 11th ed. Philadelphia, PA, USA: Elsevier; 2006:208–210 and 279–281.